GENERAL ELECTRIC COMPANY

ELECTRONICS LABORATORY

ELECTRONICS PARK, SYRACUSE, NEW YORK TELEPHONE GRANITE 6-4411

March 11, 1959

Dr. Adrian Kantrowitz
Director of Cardiovascular Surgery
Maimonides Hospital of Brooklyn
4802 Tenth Avenue
Brooklyn 19, New York

Dear Adrian:

This letter is to inform you that we have successfully tested our complete "breadboard" of the electronic circuits required for the booster heart experiments. We are now packaging the circuits so that you can use them with the dog and expect that the packaging will be completed sometime next week. I will be down in New York on Friday, March 20 and may be able to bring the package down to you at that time. Perhaps we can arrange to meet in Manhattan, Friday evening or at the hospital, Saturday of that weekend.

A block diagram of the circuit is attached. When the load is approximately 200 ohms, the stimulation waveform will closely approximate that shown by Lilly in his article on brain stimulation. The capability of the output stage is approximately 0.5 μcoulombs per pulse, or approximately two and a half times that reported by Lilly. We are including a potentiometer which will allow adjustment of the output pulse between this peak value down to about one-tenth of it. The stimulation oscillator provides a basic repetition frequency, which is 50 cps in the unit that we are building. The delay trigger-gate combination provides a time delay between the heart signal and the turning on of the stimulation oscillator of anywhere from 0.1 to 0.4 seconds, which is adjustable by a potentiometer. The amplifier is capable of amplifying signals of approximately 0.5 mv and providing enough output to trigger the delay circuit. We have added an inhibitor block to the system which makes sure that, if no heart beat is detected by the amplifier, the stimulation oscillator will be turned off. There is a time delay of approximately a half a second in the inhibiting action; that is, if the heart signal should be lost, the stimulation oscillator will be turned off within a half a second of the loss of signal. We have tested the circuit over a heart frequency range of 150 pulses per minute to 60 pulses per minute, and it works satisfactorily over the entire range.

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The current drain of the circuit when in operation is in the order of 3 ma and we are using two six-volt mercury batteries to supply the circuit power. The reason two batteries are used is due to the very high sensitivity of the input amplifier, thus requiring complete isolation of the amplifier from the rest of the circuit. With the mercury cells we are using, the equipment should operate continuously for approximately 200 hours before battery replacement is required.

We hope this will meet your requirements for the time being and will allow enough information to be obtained for the next advanced model. Bearing no unforseen difficulties in the final package, we hope you have the equipment in your hands by the end of next week. If your schedule does not permit you to meet me in New York on the weekend of the 20th, we will ship the circuit down to you with detailed operating instructions.

Regards from all. Hope your electrode experiments are proceeding fruitfully.

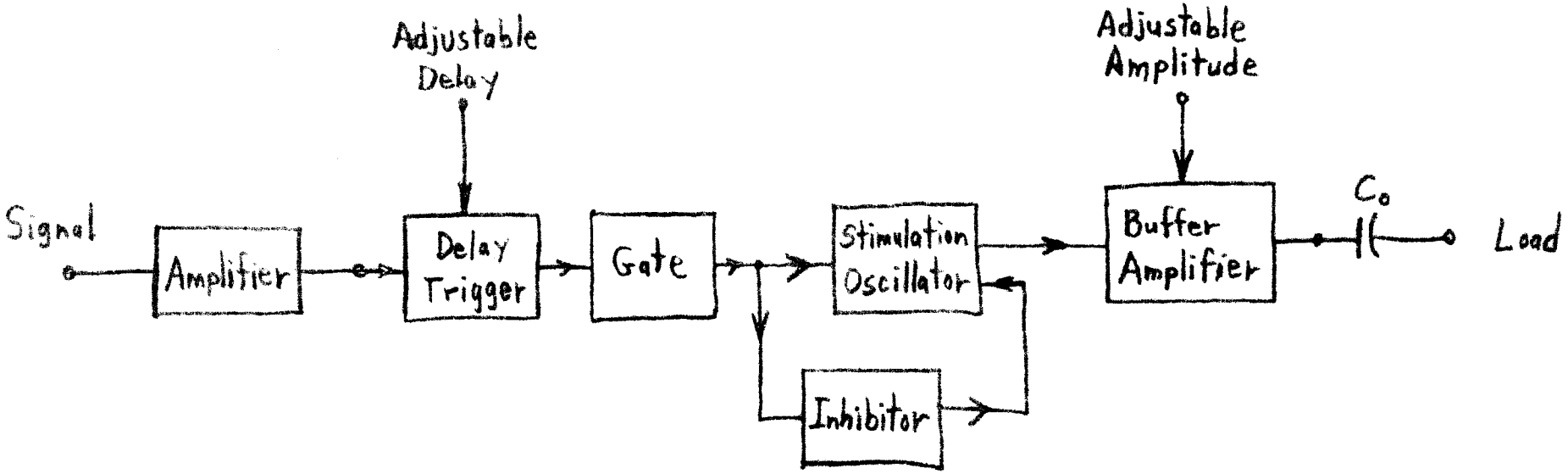
Sincerely,

J. J. Suran
Manager - Advanced Circuits
Electronics Laboratory

JJS:ad

P.S. Irv Wolf did not write you because I told him about your success in obtaining stainless steel electrodes and, consequently, the information he had for you was of little value.

cc: H. W. Abbott
J. C. Buchta
W. F. Chow
D. A. Paynter
H. N. Putschi
J. A. Raper
E. Stern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